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Raithu Sahayak: An AI Powered Voice Driven Intelligent Financial Assistant for Regional Language Farmers.

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Abstract— Farmers in rural communities often face difficulties in performing agricultural financial calculations due to limited digital literacy, complex numerical operations, and language barriers. Conventional financial applications generally require users to type information and navigate text-based interfaces, which can be difficult for users who are more comfortable communicating through regional languages.

This paper presents Raithu Sahayak, an AI-powered voice-driven financial assistant designed to simplify agricultural financial calculations for farmers. The system enables users to provide inputs through voice in regional languages such as Telugu and English. The proposed system uses the Whisper speech recognition model to convert spoken input into text and extracts relevant numerical information for further processing. A calculation module computes important financial values such as total cost, total income, and profit based on the farmer's inputs. The system also incorporates Text-to-Speech (TTS) functionality to provide the calculated results as audio output, reducing the need for reading or typing.

The proposed approach provides a simple, accessible, and voice-based interface that helps farmers perform financial calculations more conveniently. By combining speech recognition, numerical information extraction, financial computation, and speech output, Raithu Sahayak aims to bridge the digital and language gap between modern technology and rural farming communities.

Index Terms— Voice Assistant, Farmers, Speech Recognition, Whisper, Telugu Language, Text-to-Speech, Financial Calculation, Artificial Intelligence, Natural Language Processing.

I. INTRODUCTION

Agriculture is a fundamental component of the rural economy, and farmers frequently need to perform financial calculations related to cultivation costs, income, and profit. However, many farmers, particularly in rural communities, face difficulties in performing such calculations due to limited digital literacy, complex numerical operations, and language barriers.

Most existing financial and agricultural applications depend on text-based interfaces, typing, and familiarity with digital technologies. These methods can be difficult for farmers who are more comfortable communicating through regional languages. In addition, manually performing calculations such as total cost, income, and profit can be time-consuming and may result in errors.

To address these challenges, Raithu Sahayak is proposed as an AI-powered voice-driven financial assistant for farmers. The system allows users to provide financial information through voice in regional languages such as Telugu and English. Speech recognition is performed using the Whisper model, which converts spoken input into text for further processing. The system extracts the required numerical information and performs financial calculations, while Text-to-Speech provides the results through voice output.

The proposed system aims to reduce the dependence on typing and reading, making financial calculations more accessible, simple, and convenient for rural farming communities. By combining voice interaction, speech recognition, numerical information extraction, and financial computation, Raithu Sahayak bridges the digital and language gap between farmers and modern technology.

II. LITERATURE REVIEW

Several approaches have been explored to improve digital accessibility and financial assistance for rural communities:

A. *Traditional Financial Methods:*

Traditional financial methods are widely used by farmers to calculate cultivation expenses, income, and profit. These methods often involve manual calculations using notebooks, calculators, or assistance from other individuals. However, manual calculation is time-consuming and prone to numerical errors, particularly when multiple values such as cost, land area, yield, and selling price are involved.

B. Text-Based Digital Applications:

Modern agricultural and financial applications provide digital tools for recording expenses and calculating financial values. These systems can improve accuracy and reduce manual effort. However, they generally require users to type information and understand text-based interfaces, which may create difficulties for farmers

C. Voice-Based Assistants:

Voice-based systems provide a more natural method of interaction by allowing users to communicate through speech instead of typing. Such systems can be particularly useful for users who are unfamiliar with conventional digital interfaces. However, effective voice interaction requires reliable speech recognition and support for regional languages.

D. Speech Recognition Systems:

Speech recognition technologies convert spoken language into text that can be processed by computer systems. Models such as Whisper can be used to recognize spoken input and support multilingual voice processing. This makes speech recognition suitable for applications where users provide numerical and textual information through voice.

E.Proposed Approach:

Raithu Sahayak combines voice-based interaction, speech recognition, numerical information extraction, financial calculation, and Text-to-Speech output into a single system. The approach is designed to provide farmers with a simple voice-driven method for calculating agricultural financial values and receiving the results through their preferred language.

F. Proposed Approach:

Raithu Sahayak combines the advantages of voice-based interaction, speech recognition, numerical information extraction, financial calculation, and Text-to-Speech output. The system allows farmers to provide inputs through voice in their preferred language and receive the calculated financial results through voice.

This integrated approach is intended to reduce dependence on typing and manual calculations while providing a simple and accessible interface for agricultural financial assistance

III. METHODOLOGY

A. System Architecture

Raithu Sahayak is designed as a voice-driven financial assistance system that enables farmers to perform agricultural calculations through spoken input. The system consists of a web-based user interface, a Flask-based backend, a speech recognition module, a numerical information extraction module, a calculation engine, and a Text-to-Speech module.

The user first selects the preferred language, such as Telugu or English, and provides the required agricultural information through voice. The recorded audio is sent to the Flask backend for processing. The backend passes the audio to the Whisper speech recognition model, which converts the spoken input into text

The extracted text is then processed to identify the numerical values required for financial calculations. The calculation module uses these values to determine total cost, total income, and profit. Finally, the calculated results are converted into speech and presented to the farmer in the selected language.

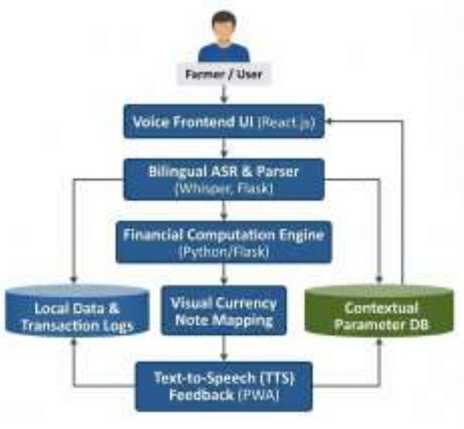

Fig. 1. Raithu Sahayak System Architecture

B. Speech Recognition Model

The proposed system uses the Whisper speech recognition model to convert the farmer's spoken input into textual information. Whisper supports multilingual speech recognition and is therefore suitable for applications involving regional languages such as Telugu.

The recorded audio is uploaded to the Flask backend, where Whisper processes the audio and generates the corresponding text. The recognized text is then passed to the numerical information extraction module for further processing.

This approach allows farmers to provide inputs naturally through speech instead of manually typing numerical values.

This model helps identify high-risk products and estimate potential financial loss.

C. Numerical Information Extraction

After speech is converted into text, the system identifies the numerical values required for the financial calculation.

For example, a farmer may provide information such as:

Cost per acre = ₹20,000
Number of acres = 3
Selling price per acre = ₹35,000

The system extracts these numerical values from the recognized speech and passes them to the calculation module.

This reduces the need for manual data entry and allows the financial calculation process to be performed automatically.

D. Financial Calculation Model

The calculation module determines the financial outcome based on the extracted values.

The total cultivation cost is calculated as:

Total Cost = Cost per Acre × Number of Acres

The total income is calculated as:

Total Income = Selling Price per Acre × Number of Acres

The resulting profit is calculated as:

Profit = Total Income − Total Cost

For example, if the cost per acre is ₹20,000, the farmer cultivates 3 acres, and the selling price is ₹35,000 per acre:

Total Cost = 20,000 × 3 = ₹60,000

Total Income = 35,000 × 3 = ₹1,05,000

Profit = 1,05,000 − 60,000 = ₹45,000

is provides the farmer with a simple and understandable representation of the financial outcome.

E. Text-to-Speech Output

After the calculations are completed, the results are converted into spoken output using a Text-to-Speech mechanism.

The output language is selected according to the farmer's preferred language. For example, when Telugu is selected, the system provides the financial results in Telugu audio. When English is selected, the results are provided in English.

This voice-based output reduces dependence on reading and makes the calculated information easier to understand for users with limited digital literacy.

F. Currency Breakdown

To improve the practical understanding of the calculated amount, the system can represent the final financial value using commonly used Indian currency denominations such as ₹500 and ₹100 notes.

For a given amount, the system determines the corresponding number of ₹500 and ₹100 notes required to represent the amount.

For example:

Amount = ₹2,500

₹500 notes = 5

This feature provides an additional simple representation of the calculated financial value.

G. Flask-Based Backend

The backend of Raithu Sahayak is implemented using the Flask framework. It handles communication between the user interface and the processing modules.

The Flask server receives the recorded audio, stores the input temporarily, sends it to the Whisper model for transcription, processes the recognized text, performs the required financial calculations, and returns the calculated results to the frontend.

The backend therefore acts as the central processing layer connecting voice input, AI-based speech recognition, numerical extraction, and financial computation

H. Overall Processing Flow

The overall workflow of Raithu Sahayak can be summarized as:

Language Selection → Voice Input → Audio Recording → Whisper Speech Recognition → Text Processing → Numerical Extraction → Financial Calculation → Text-to-Speech → Voice Output

This is the structure I recommend for your Methodology section because it matches your actual project rather than adding unrelated ML models such as KNN or predictive models.

I.System Workflow

Fig: 2 Raithu sahayak system workflow

IV. REVIEW PROCESS

The evaluation of the Raithu Sahayak system is performed in three phases:

A. Data Collection

The first phase involves collecting sample agricultural financial inputs such as cost per acre, number of acres, yield, and selling price. Different combinations of values are used to test the system under various farming scenarios.

B. Implementation and Testing

In this phase, the farmer's voice input is recorded and processed using the Whisper speech-recognition model. The converted text is analyzed to extract the required numerical values. These values are then passed to the calculation module to determine total cost, total income, and profit.

The system also generates a currency breakdown using ₹500 and ₹100 denominations and provides the final results through text-to-speech output.

C. Evaluation

The final phase evaluates the system based on speech-recognition accuracy, numerical information extraction, calculation correctness, and response time. The system is tested with different voice inputs and numerical values to verify whether the expected financial results are generated correctly.

So yes — include it. It makes your documentation look complete and research-oriented, especially since you already have sections like Introduction → Literature Review → Proposed Approach → Methodology → System Workflow → Applications/Existing Systems → Challenges

V. APPLICATIONS AND EXISTING SYSTEMS

A. Applications

1) Small and Marginal Farmers:

Small and marginal farmers often face difficulties in performing financial calculations related to agricultural activities. Calculations involving cultivation cost, land area, crop yield, selling price, total income, and profit may become difficult, especially for users with limited digital and numerical literacy.

Raithu Sahayak provides a simple voice-based interface through which farmers can provide financial information using natural speech. The system processes the spoken input and generates the required financial calculations, reducing the need for manual mathematical operations.

The system is particularly useful for farmers who prefer communicating in regional languages. By supporting Telugu and English input and providing spoken results, Raithu Sahayak makes digital financial assistance more accessible to rural users.

2) Agricultural Financial Planning:

Farmers need to estimate their expenses and expected income before making decisions related to cultivation and selling. Manual calculations can result in errors, particularly when multiple values such as cost per acre, number of acres, yield, and selling price are involved.

Raithu Sahayak processes these values and calculates important financial measures such as total cost, total income, and profit. This helps farmers understand their financial position more easily and supports better planning of agricultural activities.

The system also provides a currency breakdown of the calculated amount using ₹500 and ₹100 denominations. This makes the numerical results easier to understand for users who may have difficulty interpreting large numerical value.

3) Rural and Regional-Language Users:

Many digital applications are primarily designed around text-based interaction and may not effectively support users who are more comfortable communicating through regional languages.

Raithu Sahayak addresses this limitation through voice-based interaction. The farmer can speak the required information instead of typing it, while the system converts the speech into text for further processing. The calculated results can then be provided through text-to-speech output.

This reduces dependence on typing and improves accessibility for rural communities

4) Agricultural Extension and Support Services:

Agricultural support services can use voice-based systems to provide basic financial assistance to farmers without requiring complex digital interaction.

Raithu Sahayak can serve as a basic financial assistance layer where farmers can provide agricultural values through speech and receive calculated results. The system can reduce the effort required for routine calculations and provide results in an understandable format.

In future implementations, the system can be extended with additional agricultural information and advisory services to provide more comprehensive assistance

5) Digital Inclusion in Rural Communities:

Digital literacy remains a challenge for many rural users, particularly when applications require extensive typing, navigation, or numerical calculations.

By combining voice input, speech recognition, numerical information extraction, financial calculation, and text-to-speech output, Raithu Sahayak provides a more accessible interaction model.

The system therefore contributes to digital inclusion by allowing farmers to interact with technology using natural speech rather than depending entirely on conventional text-based interfaces.

B. Existing System Limitations

1) Heavy Dependence on Manual Calculations:

Traditional agricultural financial calculations often depend on manual calculations using paper, calculators, or basic digital tools. Farmers need to enter values and perform multiple arithmetic operations themselves.

This process is time-consuming and may result in calculation errors, particularly when several parameters such as land area, cost, yield, and selling price are involved.

2) Text-Based Digital Applications:

Many existing digital applications depend mainly on typing and text-based interaction. Users are required to enter numerical values manually through keyboards or mobile interfaces.

For farmers who have limited familiarity with typing or digital applications, this creates an additional barrier to effective technology usage. Such systems may therefore be difficult to access for users who are more comfortable with spoken communication.

3) Limited Regional-Language Support:

A major limitation of many existing financial and agricultural applications is limited support for regional languages. Applications designed primarily in English may not provide an equally accessible experience for rural users.

The lack of effective regional-language interaction can make it difficult for farmers to understand instructions, enter information, and interpret results.

4) Lack of Voice-Based Interaction:

Traditional systems generally require users to interact through text fields, buttons, or manual numerical input. They do not provide a complete voice-based mechanism for entering agricultural financial information.

As a result, users who have difficulty typing or navigating digital interfaces may find these systems inconvenient.

5) Lack of Integrated Financial Calculation:

Existing agricultural applications may provide information about farming, weather, crops, or markets, but basic financial calculations are not always integrated into a single voice-based system.

Farmers may therefore need to use separate tools for calculating total cost, income, and profit. This increases the complexity of the overall process.

6) Lack of Spoken Results:

Even when digital systems perform calculations, the results are generally displayed as text on a screen. This may not be convenient for users who have difficulty reading or interpreting numerical information.

Raithu Sahayak addresses this limitation by using text-to-speech to communicate the calculated results to the farmer.

VI.CHALLENGES

A. Speech Recognition Accuracy

One of the major challenges in developing Raithu Sahayak is achieving accurate speech recognition for regional-language inputs. Farmers may speak with different accents, pronunciations, speech speeds, and background noise. These variations can affect the accuracy of speech-to-text conversion and may result in incorrect numerical values or keywords being extracted.

Therefore, improving speech recognition accuracy is essential for ensuring reliable financial calculations and preventing incorrect results.

B. Numerical Information Extraction

Extracting numerical information correctly from converted speech is another important challenge. Farmers may express numbers in different forms or use natural sentences containing multiple values such as cost, acres, yield, and selling price.

Incorrect identification of any numerical value can affect the final calculation. Hence, the system needs reliable processing techniques to identify and associate each value with the correct financial parameter.

C. Language and Digital Literacy

Many rural users have limited experience with digital applications and may be more comfortable communicating in their native language. Complex interfaces or text-heavy applications can create difficulties for such users.

Raithu Sahayak therefore requires a simple and intuitive interface with minimal user interaction so that farmers can access the system without requiring advanced technical knowledge.

D. Internet and System Accessibility

The performance of a voice-based AI system may depend on the availability of sufficient computing resources and network connectivity, particularly when speech processing requires backend services.

Limited connectivity in rural areas can affect response time and accessibility. Designing the system to work efficiently under varying network conditions remains an important challenge.

E. Reliability of Financial Results

Financial calculations such as total cost, total income, and profit must be accurate because farmers may use the results for practical decision-making. Incorrect input extraction or calculation can lead to misleading results.

Therefore, validation of extracted values and calculation results is necessary to maintain the reliability of the system.

VII.FUTURE TRENDS

A. Advanced Regional Language Support

Future versions of Raithu Sahayak can support multiple Indian regional languages such as Telugu, Tamil, Kannada, Hindi, and other languages. Improved multilingual speech-recognition models can make the system accessible to a larger number of farmers.

B. Natural Language Understanding

Natural Language Understanding (NLU) can be integrated to understand complete farmer queries instead of only extracting numerical values. This would allow farmers to interact with the system naturally and ask financial questions using everyday language.

C. Agricultural Advisory Integration

The system can be extended beyond financial calculations by integrating agricultural advisory services. Farmers could receive information related to crop selection, fertilizers, irrigation, weather conditions, market prices, and crop management.

D. Real-Time Market Information

Future versions can integrate real-time agricultural market prices to help farmers estimate potential income based on current selling prices. This can provide more practical and up-to-date financial guidance

.E. AI-Based Financial Recommendations

AI-based recommendation techniques can be introduced to analyze farming expenses, income, and profit patterns. The system could provide personalized suggestions for improving profitability and managing agricultural expenses.

F. Offline and Edge-Based Processing

Future implementations can explore lightweight speech-recognition and AI models that can run locally on mobile or edge devices. This can reduce dependence on continuous internet connectivity and make the system more suitable for rural environments.

VIII.COMPARISON: EXISTING VS PROPOSED SYSTEM

A. Feature Comparison

Traditional financial calculation systems generally depend on manual text-based input and require users to enter values and perform calculations themselves. Such systems are less accessible to farmers who may have limited digital literacy or difficulty using text-based interfaces.

Raithu Sahayak introduces a voice-driven approach that allows farmers to provide information through spoken commands. The system supports regional-language interaction, speech-to-text conversion, numerical information extraction, automatic financial calculations, currency breakdown, and audio-based responses.

The comparison demonstrates that the proposed system combines voice interaction and automated financial processing into a single platform, making it more accessible and easier to use for rural users.

B. Interaction Comparison

In existing systems, users generally need to type financial information, understand the interface, enter multiple values, and interpret the calculated results.

In Raithu Sahayak, the user can provide information through voice. The speech is converted into text, relevant numerical values are extracted, and the calculation engine processes the information automatically. The final result is provided through both text and speech.

This reduces the amount of manual interaction required and makes the system more suitable for users who are more comfortable communicating through their regional language.

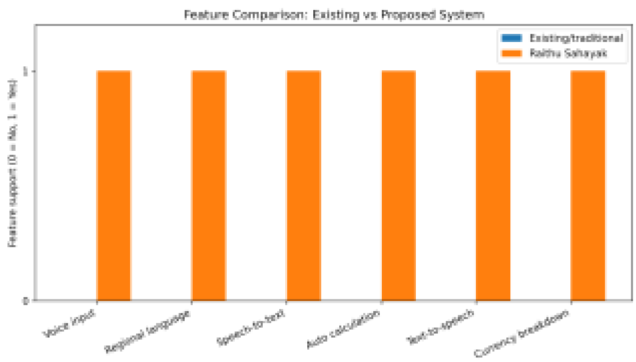

Fig. 3. Feature comparison between traditional financial systems and the proposed Raithu Sahayak system.

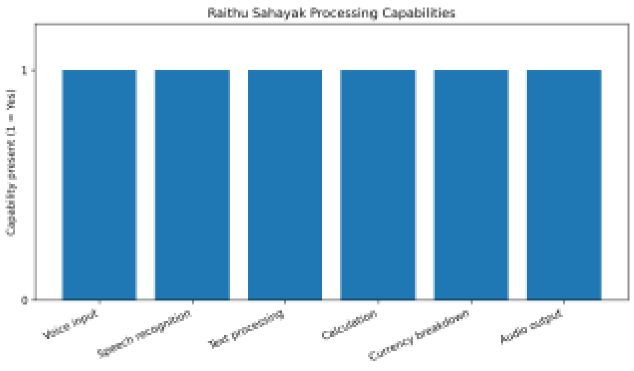

Fig. 4. Processing capabilities of the proposed Raithu Sahayak system.

IX. CONCLUSION

The proposed Raithu Sahayak system presents a voice-driven AI-based approach for assisting farmers with agricultural financial calculations. Traditional financial systems often require manual data entry and familiarity with digital interfaces, which can create difficulties for users with limited digital literacy.

Raithu Sahayak addresses these limitations by allowing users to provide financial information through voice. The system uses speech recognition and text processing to identify relevant numerical information and performs calculations such as total cost, total income, and profit.

The integration of regional-language interaction and text-to-speech output makes the system more accessible and user-friendly. The currency breakdown feature further helps users understand financial results in a practical manner.

Overall, Raithu Sahayak demonstrates how voice-based AI can be used to simplify financial calculations and improve digital accessibility for farmers. Future enhancements can extend the system with additional regional languages, agricultural advisory services, real-time market information, and more advanced natural-language understanding.

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